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The effect of 8-week hemsball training on balance, reactive agility and lower extremity strength

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Abstract

This study was designed to investigate the effects of hemsball training, upon reactive agility, balance and vertical jump tests. 80 participants, 50 of whom were the experimental group (8,82± 1,44 years) and 30 of whom (9,00 ± 1,19 years) were the control group, took part in the study. While the experimental group had 1-hour training on three days of week throughout 8 weeks, no training was done to the control group. The pre and post test results revealing both the in-group variance and differences between the groups was analyzed with the multivariate analysis of variance in repeated measurements (MANOVA) by using SPSS 19 analysis software. It was seen that the participants who played hemsball had %36,85 progress, increasing their stork balance scores from 4,45 seconds to 6,09 seconds. While this progress made a statistically significant difference ($p<0.05$), the same progress did not improve for the control group ($p>0,05$). There is not any significant in-group or intergroup difference in other tests. It was revealed that hemsball training improves balance skills in children. It is beneficial to integrate hemsball trainings into the training programs which focus on balance improvement-maintenance.

Key Words: Balance, hemsball, reactive agility, strength.

INTRODUCTION

Hemsball is a sport that was introduced to Turkey in 2011 by Altınay, thereafter supported and publicized by Turkey Sports for All Federation, and accepted as a branch of sports in 2013 by Turkish Ministry of Youth and Sports. The game is a new, amusing, and entertaining sport that people of all ages can play. It can be easily played in both indoor and open areas. In a game, in order to hold the ball and serve, it is required to have a good hand-eye-foot coordination, high level focusing and concentration. While the qualities such as high fitness level, flexibility, quickness, having good coordination, endurance and strength provide advantage to the player, there is no inconvenience for a person with low fitness level to play the game. Specific information about the sport, how it is played and its rules can be obtained from www.hemsball.com or www.his.gov.tr. Although the scientific findings about the game are few in number, the data taken from trainer's exhibit those physiological advantages of the game are versatile in terms of the player's development of psychomotor, basic motor skills, and fitness components. While the game is being played by two professional players, it becomes quite paced; and the hearth rate can rise to the level that appears during intense exercises (hard intensity) determined by ACSM (1,40) (approximately %70-89 of maximal hearth rate, the felt exhaustion on Borg Scale 14-16). However, it can be indicated that a normal game can reflect the physiological characteristics of moderate exercises. Too much abundance of movements such as standing, turning, stance, squatting in a game which brings balance, reaction, agility, and leg strength skills into the forefront. In this regard, it is considered appropriate that important movement characteristics such as lower extremity strength and balance are primarily examined in this study because of the physiological characteristics such as agility, standing, reaction of the game which effects on the players.

Reactive agility has a complicated structure that includes movement and reaction time and also incorporates quickness, perception, and decision-making (10,39). For most sports, it is the foremost

among the most distinctive motor-cognitive skills of the game and score. In many games such as basketball, soccer, tennis, table tennis, volleyball, the use of visual perception, reaction and agility together enables to score and possession of the ball. In this sense, the application of trainings that affect decision-making skills and that are perceptual for these sports might be effective. Studies in relation to this, compared to the surveys on agility with change of direction, show the importance of branch-specific reactive agility workouts and also that they can train the perception and deciding components of agility more and more (39,43). Therefore, this study examines the hypothesis that hemsball trainings can affect the scores of "Reactive Agility Test".

Balance and lower extremity strength is very important in respect to the athlete's postural control, creating an appropriate strength for the next movement, and accuracy of the standing during the game (proper array of body segments, reorganization of this array which becomes disordered while shifting from one specific body position to another) (20). It is estimated that the relationship between hemsball and balance will be parallel to those in the studies which examine the relationship between balance and trainings that include exercises that might create effects similar to hemsball. For example, with multi-modal training programs (often includes such exercises as balance, strength, flexibility and stamina) (17), fear and case of falling have decreased in elderly (4,8,9). In the study, with vertical jump test, it is aimed to get information about the changes occurred on lower extremity strength. In order for athletes to be prepared to the next move, their standing in a position that is similar to "stance" in basketball by bending the knees softly and their practicing the resistance with lower extremities lead us to think that it might enable strength and power improvement in legs.

MATERIAL & METHOD

Experimental group

Eighty elementary school students, consisting of 40 male and 40 female with an age average of 8.88, took part in the survey. In the table below, there is a comparison of the age average of the experimental group and control group, total age average and intergroup age average. Intergroup age average is not statistically different from one another.

Table 1. Comparison of ages between groups.

Groups	n	Age (Years)	Max	Min	Inter-group comp.	
Experimental	50	8.82 ± 1.44	12	7	t	F
Control	30	9.00 ± 1.19	12	7	-0.540	0.591
Total	80	8.88 ± 1.35	12	7		

Training structure

Fifty randomly chosen subjects, accompanied by hemsball trainers, took part in trainings for 1-hour on three days of week throughout 8 weeks; on the other hand, 30 subjects of the control group did not take part in any kind of trainings. Trainings were applied for 8 weeks; three days in a week, 1-hour on a day. During hemsball trainings, subjects acquired the general information about the game and were gradually taught technical trainings such as the throwing techniques, standing. In the last 4 weeks, games were played and matches were arranged.

Applied tests

In the study, two tests were applied to the subject as pre and post-test with a break of 8 weeks. All the tests were run in parquet sports halls, in a condition where it was suitable for the subjects to play sports. Before the tests, the subjects were taken to the measurement area as groups, and they were prepared for the performance tests with 10-minute exercises to organize the body heat and movement width.

Reactive agility test

Reactive agility were measured with an agility run in a distance of 10 meters. Participants started 1 meter behind the distance; and as soon as they passed the photocell, measurement began. When they passed the second photocell, they completed the first 5m score. When they passed the second photocell, they run towards the lighted photocell between the photocells, which were opposite to each other with 45-degree angle. When they passed that photocell, they completed the second 5m score. The total of these two results were recorded as total 10m score. With this test, the agility and reaction of the subjects were measured, and it was analyzed that there would be a hypothesis on the development of reaction and movement times with the help of hemsball game. Each subject repeated this three times.

Vertical jump test

The test was carried out through a jump mat in the Smartspeed system of Fusionsports brand. The result was denominated with centimeters after the calculation of air-poise time and jump height. Without taking a step, the subjects tried to jump to the highest point with their hands on their waists as they stood. After they rose upwardly, they grounded without bending their knees. Each subject repeated it three times and the highest result was used as the test result (34).

Stork balance test

The test was performed with bare feet on a flat ground. The subjects, their hands on their waists, were asked to lift up their either foot and put it to the inner side of the other knee. Following, they were asked to lift their other foot's heel with the start of timekeeper. Afterwards, the subjects were asked to preserve their position as much as possible with their lifted foot and their hands on their waists until the moment they parted their foot from their knee, or grounded their heel or removed their hands; when any of those occurred, the timekeeper was stopped and the result was denominated with seconds (35). Test was performed only with the dominant foot.

Statistical analysis

The statistical analysis of the findings was conducted via IBM SPSS 19 software. The pre- and post-test distributions of the variables in relation to the groups were examined; normality of distributions and homogeneity of the variances were determined with Mauchly Sphericity Test and Levene Test. Intergroup analysis, in-group analysis, and the analysis of the effects of the training were run through multivariate analysis of variance (MANOVA) in repeated measurements and the significance level was accepted as 0.05.

RESULTS

In the table, the pre- and post-test results of the reactive agility of the experimental and control groups were compared; and no difference was found ($p>0.05$). Likewise, there was no difference of the pre-and post-test variance for these two groups ($p>0.05$).

Having an analysis of balance test scores of the subjects, it was observed that the participants of the experimental group improved their balance scores which happens to be 1.64 seconds (%36.85). While this progress creates a statistically significant difference, the same progress did not show up for the control group; naturally, there arose a variance in terms of differences between two groups (test*group analysis).

In the table, the pre and post test results of the vertical jump tests of the experimental and control group were compared, and no significant difference was found ($p>0.05$). Likewise, there was no difference between the pre and post-test variances of these two groups ($p>0.05$).

Table 2. Intergroup and in-group comparisons of the reactive agility test.

Reactive Agility	Groups	N	Pre-test	Post-test	diff(%)	Test*Group F	p
First 5m	Experimental	50	1.66 ± 0.25	1.61 ± 0.25	0.05 (2.83)	0.045	0.832
	Control	30	2.07 ± 0.30	2.20 ± 0.311	-0.13 (-6.17)		
Second 5m	Experimental	50	2.18 ± 0.46	2.16 ± 0.370	0.013 (0.59)	0.21	0.65
	Control	30	2.07 ± 0.30	2.20 ± 0.311	-0.13 (-6.17)		
10m Total	Experimental	50	3.83 ± 0.61	3.74 ± 0.50	0.09 (2.37)	0.312	0.370
	Control	30	3.75 ± 0.43	3.81 ± 0.39	-0.06 (-1.47)		

Table 3. Intergroup and in-group comparisons of the stork balance test.

Groups	N	Pre-test	Post-test	diff(%)	Test*Grup F	p
Experimental	50	4.45 ± 2.72	6.09 ± 4.59	1.64 (36.85)*	5.376	0.023
Control	30	4.94 ± 2.13	4.70 ± 2.49	-0.24 (-4.85)		

* p<.05

Table 4. Intergroup and in-group comparison of the vertical jump test.

Groups	N	Pre-test	Post-test	diff(%)	Test*Grup F	p
Experimental	50	21.34 – 3.65	20.65 – 3.38	-0.69 (-3.23)	0.175	0.677
Control	30	22.39 – 3.94	21.98 – 4.35	-0.41 (-1.83)		

DISCUSSION

The current research was designed as an experimental study which was conducted in order to examine the functional effect of hemsball game. Considering the results, it can be said that there has been significant improvements in the children having played hemsball for 8 weeks. The most prominent one is the balance improvement. While the balance scores of the 50 subjects playing hemsball have significantly improved 1.64 seconds (%36.85), no such result emerges in relation to the control group. In stork balance test, the scores of the subjects rise to 6.09 seconds after the trainings while the subjects score 4.45 seconds in the pre-tests. While defining the characteristics of hemsball sport, it was stated that specific motor skills were important. For example quickness, coordination, balance and reaction show themselves as they are the most important skills that determine the winner. In this regard, it is not surprising that hemsball playing children improve their balance skills. Balance skill is controlled by many perceptual systems and has a complicated structure (21). For example, reflex-related balancing skill theory states that reaction and reflex responses are important in balancing (20,43). More complicated systems theory, on the other hand, accepts that many receptors (vestibular system, neuromuscular system, and kinesthetic data from proprioceptor), by being used dynamically against continuously changing internal and external forces, provide postural control (18,32). Hemsball sport is a game that the systems described in these theories are heavily used. The sport includes exercises and movements that affect the score of the game. Because of the standing, posture must change constantly with fast movements. During the game, player is supposed to deceive the opponent, catch the ball, and change his confirmed posture suddenly as he is deceived. Both static and dynamic movements, sometimes on one foot and sometimes on both feet, involve the sustenance of the posture by leaning on sidewise or bending backwards. There are numerous studies presenting the relationship of balance and sport-physical activities. While balance improvement affects sportive achievements, the rise of the amount of physical activities and balance-motor specific sports develop balance skills (14,28,33,44). In the games –like hemsball- that include many movements related to balance and postural control, the improvement is more obvious (36). Likewise, many studies on different subject groups (age, sex, physical activity level) indicated that physically active individuals have better postural performances (8,16,23,36). This explains the positive balance improvement of the exercising group. It can be stated that 8-week Hemsball training has a similar effect to long-term balance trainings (5,19).

Another point that was focused within the scope of this research was the impact of hemsball trainings to the agility that was measured by an unplanned change of direction running test. As the nature of the game, high level focusing and reaction is required; talented player can react to the sudden changes, catch the ball, and reorganize their posture. This skill is an important athletic skill in terms of its impact on hemsball sport and other sports, and it will be useful to highlight this aspect in a more controlled way in future research. Because having an overview of the agility-unplanned change of direction test results (Table 2), there is a complicated result. No difference was found between the groups regarding the pre and post-test comparison. Similarly, no difference was found in either group in relation to the pre- and post-test analyses. However, the perception of visual stimulus during the second 5 meters and passing the photocell by changing the direction decreased by 0.013 (%0.59) seconds; and the total time of 10 meters was reduced by 0.09 (%2.37). Reduction of the time for the first 5 meters by %2.83 indicates that agility-acceleration skill has also improved in the children by playing this game. Although all these variances do not have a meaning statistically, it can be considered that the game contributes to agility-acceleration and reaction skills in a positive way (the positive relationship between the reaction time and change of direction tests might be reflected on the overall score) (3). However, considering the positive relationship between agility and lower extremity strength (42,38), it can be accepted as surprising that the second measurement results of the vertical jumping test has dropped for the experimental group (Table 4). In this regard, the improvement in measurements might be coincidence and this issue should be examined with more extensive and controlled study designs. It should be kept in mind that many factors such as nutrition, intelligence, exhaustion, illness, and stimulant-drug have affected the measurements of reaction (25). In this sense, it seems hard to conduct a controlled experiment. This explains the fact that many studies in the relevant literature provided different results for the reaction skill. While some studies revealed that reaction time is reduced with exercises, (12,13), others showed that people who do sports have better reaction skills when compared to

sedentaries (29). However, in majority of the earlier studies, exercise applications have not changed the reaction skill. For example, football, aquatic and running trainings and exercises do not affect reaction time (11,31,37).

Hemsball is a complicated sport that is hard to classify physiologically because of its structure. Because of such factors as endurance in relation to the game time, coordination in relation to the game speed and severity, lower muscle strength and endurance in terms of flexibility, balance, and posture (generally softly bended knees, carrying resistance on the legs), the game requires high concentration and high level of perceptual force. In this regard, the game can be classified as multi-modal, mainly neuromotor branch (36). Naturally, its evaluation and physiological-physical effects should be made in a comparison to similar branches and training programs. The effects of multi-modal games and sports on speed, reaction, strength, balance have been exhibited in several studies. For example, defined as "exergames", the games that require extremely perceptual, proprioceptor, neuromotor control, balance-coordination, and reaction have positive impact on balance improvement familiar to this study. While, in the Berg Balance Scale (2,26,27), there has been an improvement in posture-graphic static balance measurements, also the improvement has come to light in terms of reaction time in some specific studies(7,22). With multi-component exercises, for the old people, there has been a positive change of falling number and muscular strength (6). As these studies are mainly conducted with the old subjects, the indicated variances of strength and endurance might be misleading (24).

As a result, it can be stated that the balance improvement has prominently risen in the children having 8-week hemsball trainings. In this sense, it is thought that attending to hemsball is very beneficial in conditions that it is important to improve and maintain balance skills. It is useful to examine the little amount of progress exhibited in the agility and unplanned change of direction test in further studies with more controlled and extensive research designs. Besides, it is thought that taking part in hemsball sport by children will speed up the improvements of significant motor skills such as balance, coordination, reaction, and speed. It is also thought that it will be an important game for psychomotor development; and this hypothesis should be tested in future research.

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